Testing of the filter function of a prototype device to eliminate fetal surrogate markers and bacterial load for autotransfusion in postpartum haemorrhage in low-resource settings

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Abstract

Background Postpartum haemorrhage is a leading cause of death in low-income and middle-income countries, but it is also largely preventable. As a potential solution for restoring blood volume in women with life-threatening haemorrhage in low-resource settings, a vaginal blood collection drape with adaptations for autotransfusion has been created. In this study, we aimed to assess the filtration function of the autotransfusion system prototype and to determine the degree to which the filter removes surrogate markers for amniotic fluid, fetal cells, and inhibin A, as well as to quantify the reduction of bacterial contaminants in postpartum blood after vaginal delivery.

Methods We collected postpartum blood from four women who had normal spontaneous vaginal delivery of a term pregnancy using an adapted obstetrical blood collection drape. Immediately after the delivery, the research drape was placed under the buttocks of the participant and postpartum blood was collected. The blood entered a sterile system and was filtered through a Pall LeukoGuard BC2 Cardioplegia filter via a negative pressure pump. We tested prefiltration and post-filtration samples for the presence of fetal cells, inhibin A, and surrogate markers for amniotic fluid contamination. Cultures of prefiltered and post-filtered blood underwent qualitative analysis, to identify specific bacterial species present, and quantitative analysis.

Findings We identified *Escherichia coli*, *Bacteroides fragilis*, *Klebsiella pneumoniae*, *Enterococcus faecalis*, *Corynebacterium jeikeium*, *Lactobacillus* spp, and *Staphylococcus* spp in prefiltration blood samples. In samples from three of the four participants, bacterial load decreased after filtration. However, complete elimination of a bacterial species did not occur in two participants' post-filter cultures. Fetal cells were present in one prefiltration sample and decreased but remained present after filtration. Reduction in α-fetoprotein and inhibin A varied between the four participants' post-filtration samples.

Interpretation The filter tested in the autotransfusion system prototype did not significantly reduce the surrogate markers tested nor eliminate bacteria in the four samples, although selective removal of *Staphylococcus* spp might have occurred. The system remains a promising solution to improve health outcomes of women who give birth in low-resource settings but improved filter function does need to be addressed. Future studies will test a leucocyte depletion filter, previously shown to successfully remove bacterial contaminants, as well as alter device flow rates for optimum filter function.

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Declaration of interests
We declare no competing interests.